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(54) **SURFACE CLEANING APPARATUS**

OBERFLÄCHENREINIGUNGSVORRICHTUNG

APPAREIL DE NETTOYAGE DE SURFACE

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EP 3 062 676 B1

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Description

[0001] The invention relates to a surface cleaning apparatus. In particular, this invention relates to a surface cleaning apparatus which utilises a source of suction to draw dirt etc. from a surface being cleaned and to store dirt in a chamber which can be emptied by a user. Such surface cleaning apparatus are often referred to as "vacuum cleaners".

[0002] DE2818317 shows a vacuum cleaner with a housing for a cable storage device.

[0003] According to a first aspect of the invention we provide a surface cleaning apparatus having:

- a source of suction;
- a chamber for receiving dirt having an inlet and an outlet;
- a cable storage device for storing electrical cable for providing power to the source of suction; and
- a fluid flow path for providing fluid communication between the outlet of the chamber and the source of suction;

wherein at least a portion of the fluid flow path extends through a space defined by the cable storage device and the cable storage device follows a substantially annular path around the space.

[0004] Further features of the first aspect of the invention are set out in the dependent claims thereto which are appended hereto.

[0005] Embodiments of the various aspects of the invention will now be described by way of example only, with reference to the accompany drawings, of which:

Figure 1 is a perspective view of a first embodiment of an apparatus according to the invention;

Figure 2 is a further perspective view of the apparatus of figure 1;

Figure 3a and 3b are perspective views of a main body of the apparatus of figure 1;

Figure 4 is a plan view of the main body of the apparatus of figure 1;

Figure 5 is a side cross-sectional view of the main body with a valve in a closed position;

Figure 6a is a side cross-sectional view of the main body with the valve in an open position; and

Figure 6b is a side cross-sectional view of the main body with the valve in a closed position; and

Figure 7 is a perspective cross-sectional view of the main body.

[0006] Referring to the figures, these show a first embodiment of a surface cleaning apparatus 10. In short, the apparatus 10 includes a main body 12, a first wheel 14 positioned at a first end of the main body 12 and a second wheel 16 positioned at an opposite, second, end of the main body 12. The wheels are rotatable about a respective wheel axis. The main body 12 is generally cylindrical and has a generally elongate axis A which extends lengthwise of the main body 12 between the wheels 14, 16.

[0007] The main body 12 is shaped such that an exterior surface thereof is generally concave, with the exterior surface extending circumferentially around the axis A. In more detail, in this particular embodiment the main body 12 has a central region C with respective side portions R, L which sit between the central region C and each of the wheels 14, 16. It can be seen from the figures that a radius Y of each of the portions R, L increases as the exterior surface of that portion extends from the central region C towards each wheel 14, 16. In other words, the portions R, L flare outwardly as they extend towards the wheels 14, 16.

[0008] It will be appreciated that the shape of the main body 12 ensures that there is a generally concave portion provided on a floor facing portion of the exterior surface of the main body 12, which provides a space S when the apparatus is positioned on a floor surface F with both wheels 14, 16 contacting the floor surface F.

[0009] Whilst in the present example the main body 12 is generally symmetrical about a plane which extends transversely through the central portion C and the axis A, it should be appreciated that other shapes of the main body 12 could be utilised without departing from the scope of the present invention. It need not be the case that the exterior surface of the main body 12 is generally symmetrical about the axis A. For example, the main body 12 could be shaped such that a space S is provided between the main body 12 and the floor surface F whilst an upwardly facing surface of the main body 12 is not provided with any concave portion or the like (it could be convex, for example). In this particular example it is beneficial for the radius of the ground engaging surfaces of the first and second wheels 14, 16 to be greater than the largest width of the main body 12 when measured transversely of the axis A. This ensures that the main body 12 does not foul the floor surface F when the apparatus is in use.

[0010] The main body 12 houses a source of suction 18, a chamber 20 for receiving dirt having an inlet 22 and an outlet 24, a cable storage device 26 for storing electrical cable 28 for providing power to the source of suction 18 and a fluid flow path 30 for providing fluid communication between the outlet 24 and the source of suction 18. The source of suction 18 includes a motor 18a and a fan 18b drivingly connected to the motor 18a for providing the suction. The body also houses a cyclonic separator device 32 which is in communication with the chamber 20 in a manner known in the art and so will not

be discussed in any further detail herein. The position and shape of these component parts and their interaction will be discussed in more detail later. The main body 12 is made out of a plastics material such as poly carbonate or acrylonitrile butadiene styrene (ABS). The material is opaque but it could also be made of a translucent or transparent material to permit a visual indication for the user of the level of dirt within the chamber 20. The wheels are made of a rubber material. Embodiments are envisaged where a further, second, or even third cyclonic separator device is provided. In addition, a multi-cyclonic device may be provided in the apparatus.

[0011] Each wheel is provided as an annular member which is supported for rotation by a generally circular exterior surface of a part 15, 17 of the main body 12. In other words, the parts 15, 17 of the main body 12 provide a race which supports the annular wheel member 14, 16 and permits it to rotate smoothly about its axis. Alternative configurations of the wheel could be utilised without departing from the scope of the present invention. For example, one or both wheels 14, 16 could be mounted for rotation on a common axle or respective axles which is/are connected to the main body 12.

[0012] Whilst in the present embodiment the wheels 14, 16 are rotatable about axes which are coaxial with each other and coaxial with the axis A of the main body 12, this need not be the case. For example, embodiments are envisaged where the rotational axes of the wheels are offset from the axis A. Embodiments are also envisaged where the rotational axes of the first and second wheels are neither coaxial with each other nor parallel with each other. For example, the rotational axes of the wheels 14, 16 may be inclined relative to the axis A of the main body 12.

[0013] Furthermore, whilst in the present embodiment the wheels 14, 16 are positioned at opposite ends of the main body 12, embodiments of the invention are envisaged where the wheels are positioned closer towards each other. In such embodiments, it is also envisaged that a respective portion of the main body 12 may extend laterally past each wheel, such that each wheel is positioned inwardly from the opposite ends of the main body 12.

[0014] It can be seen from the figures that the apparatus 10 includes a handle 34 which is connected to the main body 12 at the end of the main body 12 which supports the wheel 16. The user graspable handle 34 is connected to the main body 12 through the opening provided by the configuration of the annular wheel member 16. This permits a user to move the apparatus 10 to a desired location. For example, the handle 34 permits the user to stand the apparatus 10 on the end of the apparatus 10 which supports the wheel 14 such that the axis A of the main body 12 is substantially vertical. For example, this configuration may be utilised when a user is using the apparatus for cleaning a flight of stairs, or when storing the apparatus.

[0015] As can be seen from the figures the handle 34

extends diametrically across the end of the body 12 through the axis A of the main body 12 and the handle 34 is smaller than a diameter of the exterior surface of the wheel 16. This ensures that the handle 34 does not foul the floor surface F when the apparatus is being moved along the floor surface F.

[0016] In the present example the handle 34 is moveable between stored (shown in figure 3) and operable positions. In the operable position the handle 34 is moved outwardly away from the wheel 16 against the biasing of springs 35.

[0017] Advantageously, the apparatus 10 includes a plurality of deflector members 36, 37 connected to the main body 12. The purpose of the deflector members 36, 37 is to provide protection to the main body 12 and also to assist a user in manoeuvring the apparatus whilst cleaning. The deflector members 36, 37 advantageously assist the user in manoeuvring the apparatus past fixed objects e.g. door frames, chairs, tables.

[0018] User operable controls 38-40 are provided in recesses within the deflector members 37. The positioning of the user operable controls 38-40 in this location ensures that they are somewhat protected from any damage as a result of collisions between the apparatus and fixed objects.

[0019] In the present example the user operable control 38 is pivotally moveable to control the opening of a lid 21 to the chamber 20. The user operable control 40 is the power button for providing electrical connection between a mains supply and the suction motor 18a. The user operable control 39 controls activation of the cable storage device 26 to cause retraction of the cable 28 for storage in the main body 12. It should be appreciated that other user operable controls could be provided within the spaces or recesses in the deflective members 37. Whilst no user operable controls are provided in the corresponding spaces in the deflector members 36 they could be provided if desired as an alternative or addition to the controls 38-40.

[0020] As shown in figure 1 the apparatus 10 includes a tool 42 for engaging a floor surface and a conduit/hose 44 connecting the floor tool 42 to the main body 12. These components are well known in the art of such cleaners and thus will not be described in further detail.

[0021] The main body 12 includes a primary air inlet 46 which is positioned on the main body 12, midway between the first and second ends of the main body 12. The primary air inlet 46 extends through a generally upwardly facing exterior surface of the main body 12. The primary air inlet 46 is for connection to the conduit/hose 44. In this embodiment the primary air inlet 46 includes a formation having an electrical connection for providing power to the floor tool 42, although it is not essential. The main body 12 also includes an opening 48 through which the cable 28 can exit from or enter towards the cable storage device 26.

[0022] The chamber 20 is generally cylindrical and removably connected to the main body 12 such that it can

be removed through the end of the main body 12 for emptying by the user. Inlet 22 is provided on a side wall of the chamber 20 and is in fluid communication with the primary air inlet 46. A pre-filter 50 is provided on the outlet 24 to remove any particulates present in the flow of air leaving the chamber 20 to prevent them from entering the fluid flow path 30 and causing any damage by coming into contact with the fan 18b and motor 18a.

[0023] The source of suction 18, chamber 20 and cyclonic separator device 32 are positioned along the axis A of the main body 12 and, when powered, provide a suitable source of suction in order to draw air through the primary air inlet 46, cyclonic separator device 32 and pre-filter 50. Positioned around the motor 18a (near the wheel 16) is a post-motor filter 52. Air passes through this filter 52 and apertures 54 at the end of the main body 12 to atmosphere.

[0024] The source of suction 18, the cable storage device 26 and the chamber 20 are positioned in a generally side by side configuration within the main body 12. The fluid flow path 30 is a cylindrically shaped passage having one end in fluid communication with the outlet 24 and the other end of which is in fluid communication with the source of suction 18.

[0025] The cable storage device 26 is positioned substantially midway between the ends of the main body 12, between the source of suction 18 and the chamber 20 such that the component parts are sequentially aligned. In other embodiments the cable storage device 26 may be positioned in a different position away from the midway point and/or placed in a different sequential position with respect to the source of suction 18 and the chamber 20. The cable storage device 26 could be positioned elsewhere, for example between the motor 18a and the filter 52, or between the filter 50 and the suction fan 18b, or indeed in any other location within the interior of the main body 12.

[0026] Advantageously at least a portion of the fluid flow path 30 extends through the cable storage device 26. The cable storage device 26 is of an annular shape and has a space 60 within which the cable 28 is stored.

[0027] The cable storage device 26 includes an annular moveable part 62 which is rotatable about the axis A around the fluid flow path 30. In the present example the cable storage device 26 includes a means for biasing the cable 28 to be pulled into an interior of the main body 12 via the opening 48 provided on the main body 12 so that the cable 28 is coiled around the moveable part 62. A free end of the cable 28 is connected to a plug 56 which, when the cable 28 is fully stored, is at least partially received in a recess 58 in the main body 12. In other words, the moveable part 62 is rotatable around the portion of the fluid flow path 30 and extends circumferentially around a surface of the fluid flow path. The moveable part 62 is thus parallel and coaxial with the axis A of the main body 12. This provides for an optimum use of the interior space of the main body 12 allowing for a more compact configuration of the surface cleaning apparatus

10. In other embodiments the moveable part 62 may only extend partially around the fluid flow path 30.

[0028] In particular, the cable storage device 26 defines a space 64 into and through which the fluid flow path 30 extends and around which space 64 the cable storage device 26 follows a substantially annular path. The space 64 is formed substantially centrally of the cable storage device 26 so as to further minimise the space taken by the component parts and maximise the length of cable 28 which can be accommodated within the interior space of the main body 12. The space 64 is generally cylindrical and has an elongate axis which is substantially parallel and coaxial with the axis of the cable storage device 26.

[0029] It will be seen that the cable storage device 26 has an axis which is substantially parallel with an axis of the source of suction 18, an axis of the chamber 20 and the axis A of the main body 12 so as to provide a generally substantially coaxial arrangement. However, in other embodiments the components may not be co-axial and, instead, their respective axes may be offset from one another and/or the axis A of the main body 12.

[0030] The side by side configuration of the cable storage device 26, source of suction 18 and the chamber 20 means that the respective component parts are positioned along the axis A of the main body 12. In this way the component parts are in an end to end relationship by which it is meant that each component occupies a respective space which is separate from a space in which another component is positioned.

[0031] Although the example is described with respect to the surface cleaning apparatus 10 of the cylinder type, it will be appreciated that the present invention could equally be applied to that of an upright type cleaner. More particularly, the configuration of having a cable storage device 26 positioned such that the fluid flow path 30 that connects the source of suction 18 to the chamber 20 extends through the cable storage device 26 provides for space savings which can equally apply to upright cleaners and other types of shapes of the main body 12.

[0032] It will also be appreciated that in this embodiment there is a separate passage which provides the fluid flow path 30 between the chamber 20 and the source of suction 18. However, other embodiments are envisaged where the fluid flow path 30 may be provided by an integral portion of the cable storage device 26 such that the cable storage device 26 moves together with the portion of the fluid flow path 30 during use. In the present example the cable storage device 26 is supported on the fluid flow path 30 but it could, alternatively, be mounted and rotatable with the fluid flow path 30 in other embodiments.

[0033] Also, whilst the cable storage device 26 includes means for biasing the cable 28 to be drawn into the interior of the main body 12, embodiments are envisaged which include a manually operable means for winding the cable 28 into the main body 12. For example there could be a handle accessible outside of the main body

12 which a user moves so as to rotate the annular member 62 so as to wind the cable 28 into the interior of the main body 12.

[0034] With reference to the figures a second aspect of the present invention will now be described. The cable storage device 26 includes the space 60 for storage of the cable 28 and the apparatus 10 includes an opening 48 through which the cable 28 can exit and enter the cable storage device 26. The apparatus 10 also includes a valve 66, in the form of pressure relief valve, which provides for fluid communication between the cable storage device space 60 and the source of suction 18. The valve 66 includes an actuator having a seal 67 which is mechanically operable to move between a closed position in which air is not permitted to flow from the space 60 to the source of suction 18, and an open position in which air is permitted to flow from the space 60 to the source of suction 18. In the closed position, the seal 67 prevents air from flowing from the valve 66 to the source of suction 18. The space 60 in which the cable 28 is stored is substantially sealed from atmosphere apart from the opening 48.

[0035] The valve 66 is provided in a wall 68 between the cable storage device 26 and the space in which the source of suction 18 is positioned. The valve 66 is biased by a spring to the closed position (Fig. 6a) and is configured to move to the open position (Fig. 6b) in which it permits air to flow from the space 60 to the source of suction 18 when the pressure in the fluid flow path 30 reaches a predetermined threshold.

[0036] During normal operation of the apparatus 10, the source of suction 18 will provide suction to the chamber 20 and primary air inlet 46 causing a drop in pressure. This will cause air to flow through the primary air inlet 46, through the cyclonic separator device 32 which separates dirt entrained in the air, and the substantially cleaned air passes through the outlet 24 of the chamber 20 and pre-filter 50. The air will follow the fluid flow path 30 through the motor housing and to atmosphere through the apertures 54 provided in the end of the main body 12. This has the effect of cooling the motor 18a during operation and preventing overheating. This flow path is shown in Fig. 5.

[0037] However, if an obstruction occurs upstream of the source of suction 18, for example, within the chamber 20, there will be no air passing from the outlet 24 of the chamber 20 through the motor housing to atmosphere. The pressure will then drop as the source of suction 18 continues to draw suction on the fluid flow path 30. There is then little or no cooling of the motor 18a as no air will pass through the motor housing and as a result the motor 18a will begin to heat. However, once the pressure reaches a pre-determined threshold, the valve 66 will move to its open position and then air from atmosphere can pass through the cable opening 48 on the main body 12 and the valve 66 to the motor 18a via the fan 18b before being exhausted to atmosphere. This arrangement therefore allows for cooling of the motor 18a in the event of an

obstruction occurring in the flow path upstream of the motor 18a. This flow path is shown in Fig. 6.

[0038] In this embodiment the valve 66 is a mechanical valve but in other embodiments it is envisaged that an automated valve is provided which is operated by electronic means. In such embodiments there may be a pressure sensor positioned, in, for example, the fluid flow path 30, which senses when the pressure reaches the pre-determined threshold and provides an output signal to a control means for moving the automated valve to the open position.

[0039] Embodiments of apparatus are envisaged which do not include a cyclonic separator device, but instead utilise a receptacle, bag or the like for collecting dirt which is supported within the chamber 20. In addition, embodiments are envisaged which do not include a cable storage device 26, although it is desirable for the apparatus to be provided with such a device in order to ensure compact storage of the electrical cable 28.

[0040] Whilst in the above examples a "dry" apparatus is taught, it should be appreciated that the apparatus could be modified to be a "wet" system, i.e. utilising a source of cleaning fluid within the apparatus which is applied to the floor surface before being sucked back in to a chamber within the main body.

[0041] In each of the embodiments the chamber 20 is capable of receiving dirt, which definition encompasses either directly receiving dirt or there being a bag or the like supported within the chamber 20 which itself collects dirt.

[0042] The axis of the main body is a generally elongate axis thereof which in this example extends lengthwise of the apparatus between the first and second wheels.

[0043] When used in this specification and claims, the terms "comprises" and "comprising" and variations thereof mean that the specified features, steps or integers are included. The terms are not to be interpreted to exclude the presence of other features, steps or components.

Claims

1. A surface cleaning apparatus (10) including:

- a source of suction (18);
- a chamber for receiving dirt (20) having an inlet (22) and an outlet (24);
- a cable storage device (26) for storing electrical cable (28) for providing power to the source of suction; and
- a fluid flow path (30) for providing fluid communication between the outlet of the chamber and the source of suction;

characterized in that at least a portion of the fluid flow path extends through a space (64) defined by the cable storage device and the cable storage device follows a substantially annular

- path around the space.
2. A surface cleaning apparatus according to claim 1 wherein the source of suction, the chamber for receiving dirt and the cable storage device are positioned in a generally side by side configuration.
 3. A surface cleaning apparatus according to claim 1 or claim 2 including:
 - a body (12) with an elongate axis (A);
 - wherein the body includes:
 - a first end which preferably includes a first wheel (14) being preferably positioned at or near the first end of the body; and
 - a second end which preferably includes a second wheel (16) being preferably positioned at or near the second of the body; and
 - wherein the body houses one or more of the source of suction, chamber and cable storage device; preferably wherein the axis of the main body is generally horizontal when both the first and second wheels are engaged with a surface to be cleaned.
 4. A surface cleaning apparatus according to any preceding claim wherein an axis of the cable storage device is substantially parallel or coaxial with an axis of the source of suction and/or the axis of the chamber and/or the body.
 5. A surface cleaning apparatus according to any preceding claim, the space being formed substantially centrally of the cable storage device; and/or wherein the space is generally cylindrical; and/or wherein the space has an elongate axis substantially parallel/coaxial with an axis of cable storage device.
 6. A surface cleaning apparatus according to any preceding claim wherein the cable storage device is positioned between the source of suction and the chamber for receiving dirt, preferably such that they are sequentially aligned, preferably wherein the cable storage device is positioned substantially midway between the ends of the body.
 7. A surface cleaning apparatus according to any preceding claim wherein the cable storage device includes a moveable part (62) which is rotatable around the portion of the fluid flow path.
 8. A surface cleaning apparatus according to claim 7 wherein the moveable part is substantially annular and partially or wholly extends circumferentially around a surface of the fluid flow path; and/or wherein the moveable part is rotatable about the axis of the cable storage device.
 9. A surface cleaning apparatus according to claim 8 wherein the axis of rotation is parallel or coaxial with the axis of the body.
 10. A surface cleaning apparatus according to any preceding claim wherein the cable storage device is supported on and preferably rotatable around the fluid flow path, preferably wherein the cable storage device is mounted to and preferably rotatable with the fluid flow path.
 11. A surface cleaning apparatus according to claim 3 or any one of claims 4 to 10 when directly or indirectly dependent on claim 3 wherein the body includes a primary air inlet (46) positioned substantially midway between the first and second ends; preferably wherein the primary air inlet extends through a generally upwardly facing exterior surface of the body.
 12. A surface cleaning apparatus according to claim 3 or any one of claims 4 to 11 when directly or indirectly dependent on claim 3 wherein the surface cleaning apparatus includes one or more or all of the following:
 - a) the body is generally cylindrical and a portion of the body positioned in between a central region of the body and each end and/or wheel of the body has a radius which increases as it extends towards each end and/or wheel;
 - b) the body has a generally concave exterior surface;
 - c) an exterior surface of the body includes a generally concave portion;
 - d) the body houses the chamber for receiving dirt;
 - e) the chamber for receiving dirt is removably connected to the body;
 - f) each wheel includes an annular member which is supported for rotation by an exterior surface of a part of the body (15, 17);
 - g) the body is generally symmetrical, preferably about a plane which extends through the cable storage device;
 - h) the apparatus includes a handle (34) connected to one end of the body;
 - i) the body houses a first cyclonic separator device, preferably the body housing a further second cyclonic separator device which is in fluid communication with the first cyclonic separator device.
 13. A surface cleaning apparatus according to any preceding claim including an opening through which the cable extends/exits; wherein the apparatus includes a valve for permitting fluid to flow from the cable storage device space to the source of suction.

14. A surface cleaning apparatus according to claim 13 wherein the surface cleaning apparatus includes one or more or all of the following:

a) the pressure relief valve is configured to permit air to flow from the space to the source of suction when the pressure in the fluid flow path reaches a predetermined threshold;
 b) the space is substantially sealed from atmosphere apart from the opening through which the cable extends, preferably wherein the space is sealed from atmosphere apart from the opening through which the cable extends;
 c) the valve is provided in a wall between the cable storage device and the space in which the source of suction is positioned;
 d) the flow of fluid through the valve is substantially only by way of the opening through which the cable extends, preferably wherein the flow of fluid through the valve is only by way of the opening through which the cable extends, even more preferably wherein the valve is a pressure relief valve, and most preferably wherein the pressure relief valve includes an actuator which is mechanically operable to move between a closed position in which air is not permitted to flow from the space to the source of suction, and an open position in which air is permitted to flow from the space to the source of suction.

15. A surface cleaning apparatus according to any preceding claim, wherein the apparatus is of the cylinder or upright type.

Patentansprüche

1. Oberflächenreinigungsvorrichtung (10), die Folgendes beinhaltet:

eine Saugquelle (18);
 eine Schmutzaufnahmekammer (20), die einen Einlass (22) und einen Auslass (24) aufweist;
 eine Kabelaufbewahrungsvorrichtung (26) zum Aufbewahren eines Elektrokabels (28) zur Stromversorgung der Saugquelle; und
 einen Fluidströmungsweg (30), der eine Fluidkommunikation zwischen dem Auslass der Kammer und der Saugquelle vorsieht;
dadurch gekennzeichnet, dass sich mindestens ein Abschnitt des Fluidströmungswegs durch einen von der Kabelaufbewahrungsvorrichtung definierten Raum (64) erstreckt und die Kabelaufbewahrungsvorrichtung einem im Wesentlichen ringförmigen Weg um den Raum herum folgt.

2. Oberflächenreinigungsvorrichtung nach Anspruch

1, worin die Saugquelle, die Schmutzaufnahmekammer und die Kabelaufbewahrungsvorrichtung in einer generellen Seite-an-Seite-Konfiguration positioniert sind.

3. Oberflächenreinigungsvorrichtung nach Anspruch 1 oder Anspruch 2, die Folgendes beinhaltet:
 einen Körper (12) mit einer länglichen Achse (A);
 worin der Körper Folgendes beinhaltet:

ein erstes Ende, das bevorzugt ein erstes Rad (14) beinhaltet, das bevorzugt an oder nahe dem ersten Ende des Körpers positioniert ist; und
 ein zweites Ende, das bevorzugt ein zweites Rad (16) beinhaltet, das bevorzugt an oder nahe dem zweiten Ende des Körpers positioniert ist; und
 worin der Körper eine oder mehrere der Saugquelle, Kammer und Kabelaufbewahrungsvorrichtung aufnimmt;
 bevorzugt, worin die Achse des Hauptkörpers generell horizontal ist, wenn sowohl das erste als auch zweite Rad mit einer zu reinigenden Oberfläche in Eingriff sind.

4. Oberflächenreinigungsvorrichtung nach einem vorhergehenden Anspruch, worin eine Achse der Kabelaufbewahrungsvorrichtung im Wesentlichen parallel oder koaxial zu einer Achse der Saugquelle und/oder der Achse der Kammer und/oder des Körpers ist.

5. Oberflächenreinigungsvorrichtung nach einem vorhergehenden Anspruch, wobei der Raum im Wesentlichen mittig in der Kabelaufbewahrungsvorrichtung gebildet ist; und/oder worin der Raum generell zylindrisch ist; und/oder worin der Raum eine längliche Achse im Wesentlichen parallel/koaxial zu einer Achse der Kabelaufbewahrungsvorrichtung aufweist.

6. Oberflächenreinigungsvorrichtung nach einem vorhergehenden Anspruch, worin die Kabelaufbewahrungsvorrichtung zwischen der Saugquelle und der Schmutzaufnahmekammer positioniert ist, bevorzugt so, dass sie sequenziell ausgerichtet sind, bevorzugt, worin die Kabelaufbewahrungsvorrichtung im Wesentlichen in der Mitte zwischen den Enden des Körpers positioniert ist.

7. Oberflächenreinigungsvorrichtung nach einem vorhergehenden Anspruch, worin die Kabelaufbewahrungsvorrichtung ein bewegliches Teil (62) beinhaltet, das um den Abschnitt des Fluidströmungswegs drehbar ist.

8. Oberflächenreinigungsvorrichtung nach Anspruch 7, worin das bewegliche Teil im Wesentlichen ring-

förmig ist und sich teilweise oder ganz umfänglich um eine Oberfläche des Fluidströmungswegs erstreckt; und/oder worin das bewegliche Teil um die Achse der Kabelaufbewahrungsvorrichtung drehbar ist.

9. Oberflächenreinigungsvorrichtung nach Anspruch 8, worin die Drehachse parallel oder koaxial zu der Achse des Körpers ist.

10. Oberflächenreinigungsvorrichtung nach einem vorhergehenden Anspruch, worin die Kabelaufbewahrungsvorrichtung auf dem Fluidströmungsweg abgestützt und bevorzugt um diesen drehbar ist, bevorzugt, worin die Kabelaufbewahrungsvorrichtung an und bevorzugt drehbar mit dem Fluidströmungsweg montiert ist.

11. Oberflächenreinigungsvorrichtung nach Anspruch 3 oder einem der Ansprüche 4 bis 10, wenn direkt oder indirekt von Anspruch 3 abhängig, worin der Körper einen primären Lufteinlass (46) beinhaltet, der im Wesentlichen in der Mitte zwischen dem ersten und zweiten Ende positioniert ist; bevorzugt, worin sich der primäre Lufteinlass durch eine generell nach oben weisende Außenfläche des Körpers erstreckt.

12. Oberflächenreinigungsvorrichtung nach Anspruch 3 oder einem der Ansprüche 4 bis 11, wenn direkt oder indirekt von Anspruch 3 abhängig, worin die Oberflächenreinigungsvorrichtung eins oder mehrere oder alle von Folgendem beinhaltet:

a) der Körper ist generell zylindrisch und ein Abschnitt des Körpers, der zwischen einem zentralen Bereich des Körpers und jedem Ende und/oder Rad des Körpers positioniert ist, hat einen Radius, der zunimmt, wenn er sich hin zu jedem Ende und/oder Rad erstreckt;

b) der Körper hat eine generell konkave Außenfläche;

c) eine Außenfläche des Körpers beinhaltet einen generell konkaven Abschnitt;

d) der Körper nimmt die Schmutzaufnahmekammer auf;

e) die Schmutzaufnahmekammer ist abnehmbar mit dem Körper verbunden;

f) jedes Rad beinhaltet ein ringförmiges Element, das zur Drehung durch eine Außenfläche eines Teils des Körpers (15, 17) abgestützt ist;

g) der Körper ist generell symmetrisch, bevorzugt um eine Ebene, die sich durch die Kabelaufbewahrungsvorrichtung erstreckt;

h) die Vorrichtung beinhaltet einen mit einem Ende des Körpers verbundenen Griff (34);

i) der Körper nimmt einen ersten Zyklonabscheider auf, bevorzugt, wobei der Körper einen wei-

teren zweiten Zyklonabscheider aufnimmt, der in Fluidkommunikation mit dem ersten Zyklonabscheider ist.

13. Oberflächenreinigungsvorrichtung nach einem vorhergehenden Anspruch, einschließlich einer Öffnung, durch die das Kabel verläuft/austritt; worin die Vorrichtung ein Ventil beinhaltet, das einen Fluidfluss von dem Kabelaufbewahrungsvorrichtungsbereich zu der Saugquelle gestattet.

14. Oberflächenreinigungsvorrichtung nach Anspruch 13, worin die Oberflächenreinigungsvorrichtung eins oder mehrere oder alle von Folgendem beinhaltet:

a) das Druckentlastungsventil ist dafür konfiguriert, einen Luftfluss von dem Raum zu der Saugquelle zu gestatten, wenn der Druck in dem Fluidströmungsweg eine vorbestimmte Schwelle erreicht;

b) der Raum ist im Wesentlichen gegenüber der Atmosphäre abgedichtet, abgesehen von der Öffnung, durch die das Kabel verläuft, bevorzugt, worin der Raum gegenüber der Atmosphäre abgedichtet ist, abgesehen von der Öffnung, durch die das Kabel verläuft;

c) das Ventil ist in einer Wand zwischen der Kabelaufbewahrungsvorrichtung und dem Raum, in dem die Saugquelle positioniert ist, bereitgestellt;

d) der Fluidfluss durch das Ventil erfolgt im Wesentlichen nur mittels der Öffnung, durch die das Kabel verläuft, bevorzugt, worin der Fluidfluss durch das Ventil nur mittels der Öffnung erfolgt, durch die das Kabel verläuft, sogar noch bevorzugter, worin das Ventil ein Druckentlastungsventil ist, und am bevorzugtesten, worin das Druckentlastungsventil einen Aktor beinhaltet, der mechanisch betätigbar ist zur Bewegung zwischen einer geschlossenen Position, in der ein Luftfluss von dem Raum zu der Saugquelle nicht gestattet ist, und einer offenen Position, in der ein Luftfluss von dem Raum zu der Saugquelle gestattet ist.

15. Oberflächenreinigungsvorrichtung nach einem vorhergehenden Anspruch, worin die Vorrichtung zur Boden- oder Stielausführung gehört.

Revendications

1. Appareil de nettoyage de surface (10) incluant :

une source d'aspiration (18) ;
une chambre destinée à recevoir la saleté (20) ayant un orifice d'entrée (22) et un orifice de sortie (24) ;

un dispositif de stockage de câble (26) pour stocker un câble électrique (28) servant à fournir de l'énergie à la source d'aspiration ; et un trajet d'écoulement de fluide (30) servant à fournir une communication fluide entre l'orifice de sortie de la chambre et la source d'aspiration ;

caractérisé en ce qu'au moins une partie du trajet d'écoulement de fluide s'étend à travers un espace (64) défini par le dispositif de stockage de câble et le dispositif de stockage de câble suit un trajet sensiblement annulaire autour de l'espace.

2. Appareil de nettoyage de surface selon la revendication 1, dans lequel la source d'aspiration, la chambre destinée à recevoir la saleté et le dispositif de stockage de câble sont positionnés dans une configuration généralement côte à côte.

3. Appareil de nettoyage de surface selon la revendication 1 ou la revendication 2, incluant : un corps (12) avec un axe allongé (A) ; dans lequel le corps inclut :

une première extrémité qui inclut de préférence une première roue (14) étant de préférence positionnée à ou près de la première extrémité du corps ; et

une deuxième extrémité qui inclut de préférence une deuxième roue (16) étant de préférence positionnée à ou près de la deuxième extrémité du corps ; et

dans lequel le corps abrite un ou plusieurs éléments parmi la source d'aspiration, la chambre et le dispositif de stockage de câble ; de préférence dans lequel l'axe du corps principal est généralement horizontal quand à la fois les première et deuxième roues sont en prise avec une surface à nettoyer.

4. Appareil de nettoyage de surface selon l'une quelconque des revendications précédentes, dans lequel un axe du dispositif de stockage de câble est sensiblement parallèle ou coaxial avec un axe de la source d'aspiration et/ou l'axe de la chambre et/ou le corps.

5. Appareil de nettoyage de surface selon l'une quelconque des revendications précédentes, l'espace étant formé sensiblement au centre du dispositif de stockage de câble ; et/ou dans lequel l'espace est généralement cylindrique ; et/ou dans lequel l'espace a un axe allongé sensiblement parallèle/coaxial avec un axe de dispositif de stockage de câble.

6. Appareil de nettoyage de surface selon l'une quel-

conque des revendications précédentes dans lequel le dispositif de stockage de câble est positionné entre la source d'aspiration et la chambre destinée à recevoir la saleté, de préférence de telle sorte qu'elles sont alignées séquentiellement, de préférence dans lequel le dispositif de stockage de câble est positionné sensiblement à mi-chemin entre les extrémités du corps.

7. Appareil de nettoyage de surface selon l'une quelconque des revendications précédentes dans lequel le dispositif de stockage de câble inclut une partie mobile (62) qui peut tourner autour de la partie du trajet d'écoulement de fluide.

8. Appareil de nettoyage de surface selon la revendication 7, dans lequel la partie mobile est sensiblement annulaire et s'étend partiellement ou complètement autour de la circonférence d'une surface du trajet d'écoulement de fluide ; et/ou dans lequel la partie mobile peut tourner autour de l'axe du dispositif de stockage de câble.

9. Appareil de nettoyage de surface selon la revendication 8, dans lequel l'axe de rotation est parallèle ou coaxial avec l'axe du corps.

10. Appareil de nettoyage de surface selon l'une quelconque des revendications précédentes, dans lequel le dispositif de stockage de câble est soutenu sur et, de préférence, peut tourner autour du trajet d'écoulement de fluide, de préférence dans lequel le dispositif de stockage de câble est monté sur et, de préférence, peut tourner avec le trajet d'écoulement de fluide.

11. Appareil de nettoyage de surface selon la revendication 3 ou l'une quelconque des revendications 4 à 10 quand elles dépendent directement ou indirectement de la revendication 3, dans lequel le corps inclut un orifice d'entrée d'air primaire (46) positionné sensiblement à mi-chemin entre les première et deuxième extrémités ; de préférence dans lequel l'orifice d'entrée d'air primaire s'étend à travers une surface extérieure du corps généralement tournée vers le haut.

12. Appareil de nettoyage de surface selon la revendication 3 ou selon l'une quelconque des revendications 4 à 11 quand elles dépendent directement ou indirectement de la revendication 3, dans lequel l'appareil de nettoyage de surface inclut un ou plusieurs ou tous les éléments suivants :

a) le corps est généralement cylindrique et une partie du corps positionnée entre une région centrale du corps et chaque extrémité et/ou roue du corps a un rayon qui augmente à mesure qu'il

- s'étend vers chaque extrémité et/ou roue ;
 b) le corps a une surface extérieure généralement concave ;
 c) une surface extérieure du corps inclut une partie généralement concave ; 5
 d) le corps abrite la chambre destinée à recevoir la saleté ;
 e) la chambre destinée à recevoir la saleté est reliée de manière amovible au corps ;
 f) chaque roue inclut un élément annulaire qui est soutenu en rotation par une surface extérieure d'une partie du corps (15, 17) ; 10
 g) le corps est généralement symétrique, de préférence par rapport à un plan qui s'étend à travers le dispositif de stockage de câble ; 15
 h) l'appareil inclut une poignée (34) reliée à une extrémité du corps ;
 i) le corps abrite un premier dispositif de séparation cyclonique, de préférence le corps abrite un autre deuxième dispositif de séparation cyclonique qui est en communication fluïdique avec le premier dispositif de séparation cyclonique. 20
- 13.** Appareil de nettoyage de surface selon l'une quelconque des revendications précédentes incluant une ouverture à travers lequel le câble s'étend/sort ; dans lequel l'appareil inclut une soupape pour permettre au fluide de s'écouler de l'espace du dispositif de stockage de câble vers la source d'aspiration. 25 30
- 14.** Appareil de nettoyage de surface selon la revendication 13, dans lequel l'appareil de nettoyage de surface inclut un ou plusieurs ou tous les éléments suivants : 35
- a) la soupape de décharge est configurée pour permettre à l'air de s'écouler de l'espace vers la source d'aspiration quand la pression dans le trajet d'écoulement de fluide atteint un seuil prédéterminé ; 40
 b) l'espace est sensiblement hermétique à l'atmosphère à part l'orifice à travers lequel le câble s'étend, de préférence dans lequel l'espace est hermétique à l'atmosphère à part l'orifice à travers lequel le câble s'étend ; 45
 c) la soupape est munie d'une paroi entre le dispositif de stockage de câble et l'espace dans lequel la source d'aspiration est positionnée ;
 d) l'écoulement de fluide à travers la soupape est sensiblement uniquement par le biais de l'orifice à travers lequel le câble s'étend, de préférence dans lequel l'écoulement de fluide à travers la soupape est uniquement par le biais de l'orifice à travers lequel le câble s'étend, plus 50
 préférablement dans lequel la soupape est une soupape de décharge, et encore plus préférablement dans lequel la soupape de décharge 55

inclut un actionneur qui peut être actionné mécaniquement pour se déplacer entre une position fermée dans laquelle l'air n'est pas autorisé à s'écouler de l'espace vers la source d'aspiration, et une position ouverte dans laquelle l'air est autorisé à s'écouler de l'espace vers la source d'aspiration.

- 15.** Appareil de nettoyage de surface selon l'une quelconque des revendications précédentes, dans lequel l'appareil est de type cylindrique ou balai.

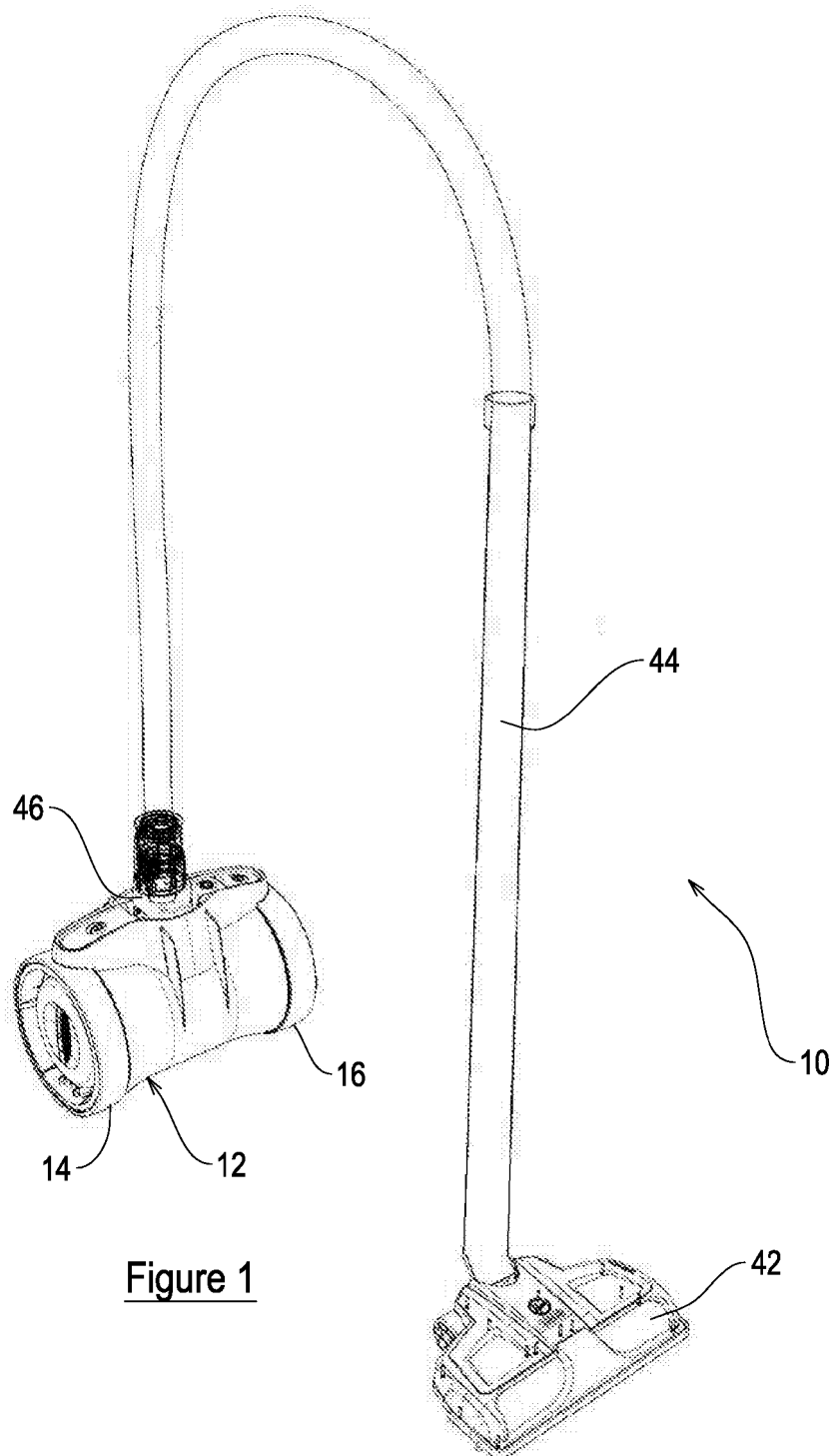


Figure 1

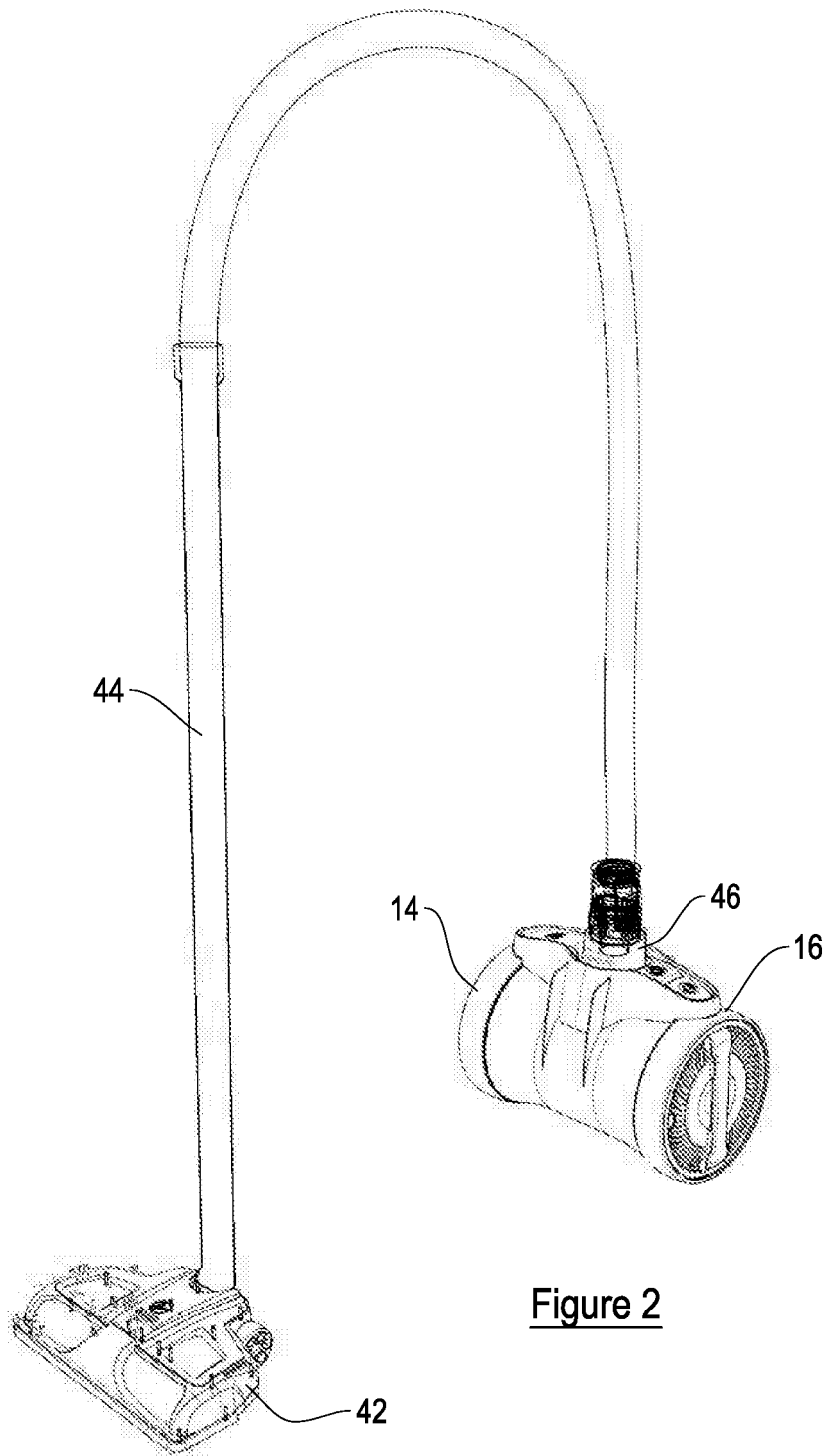


Figure 2

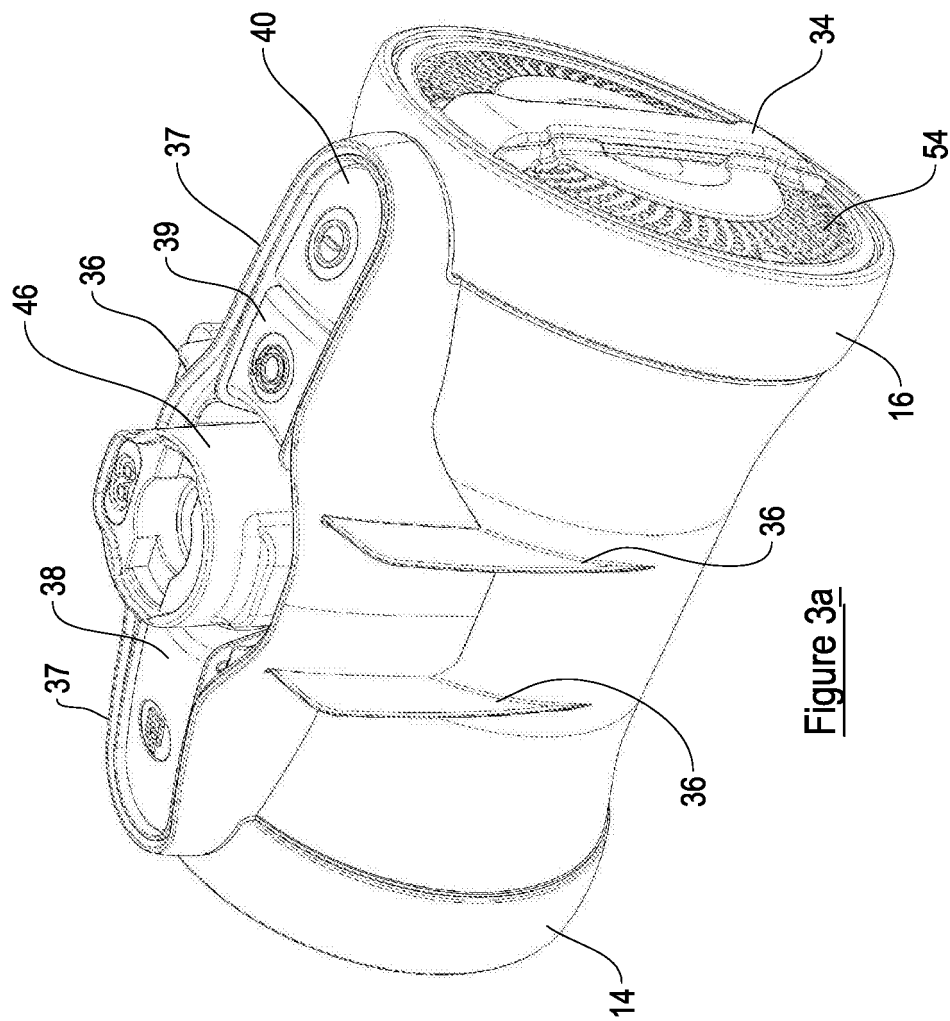


Figure 3a

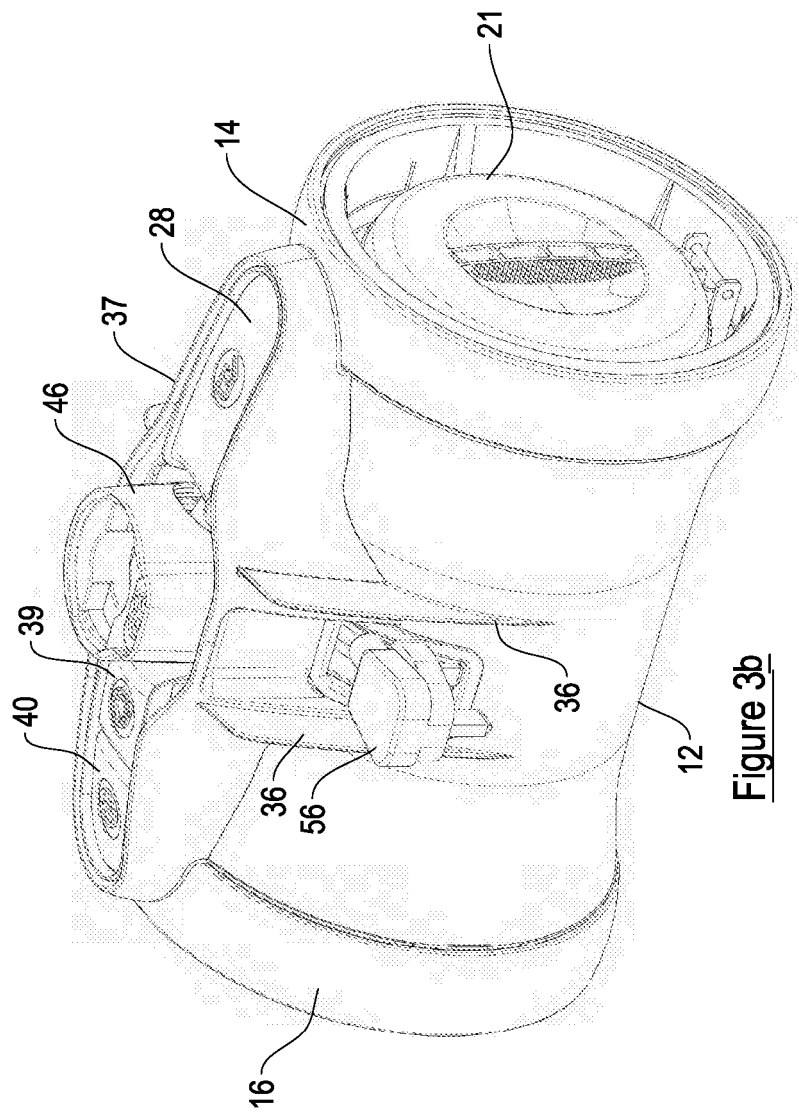


Figure 3b

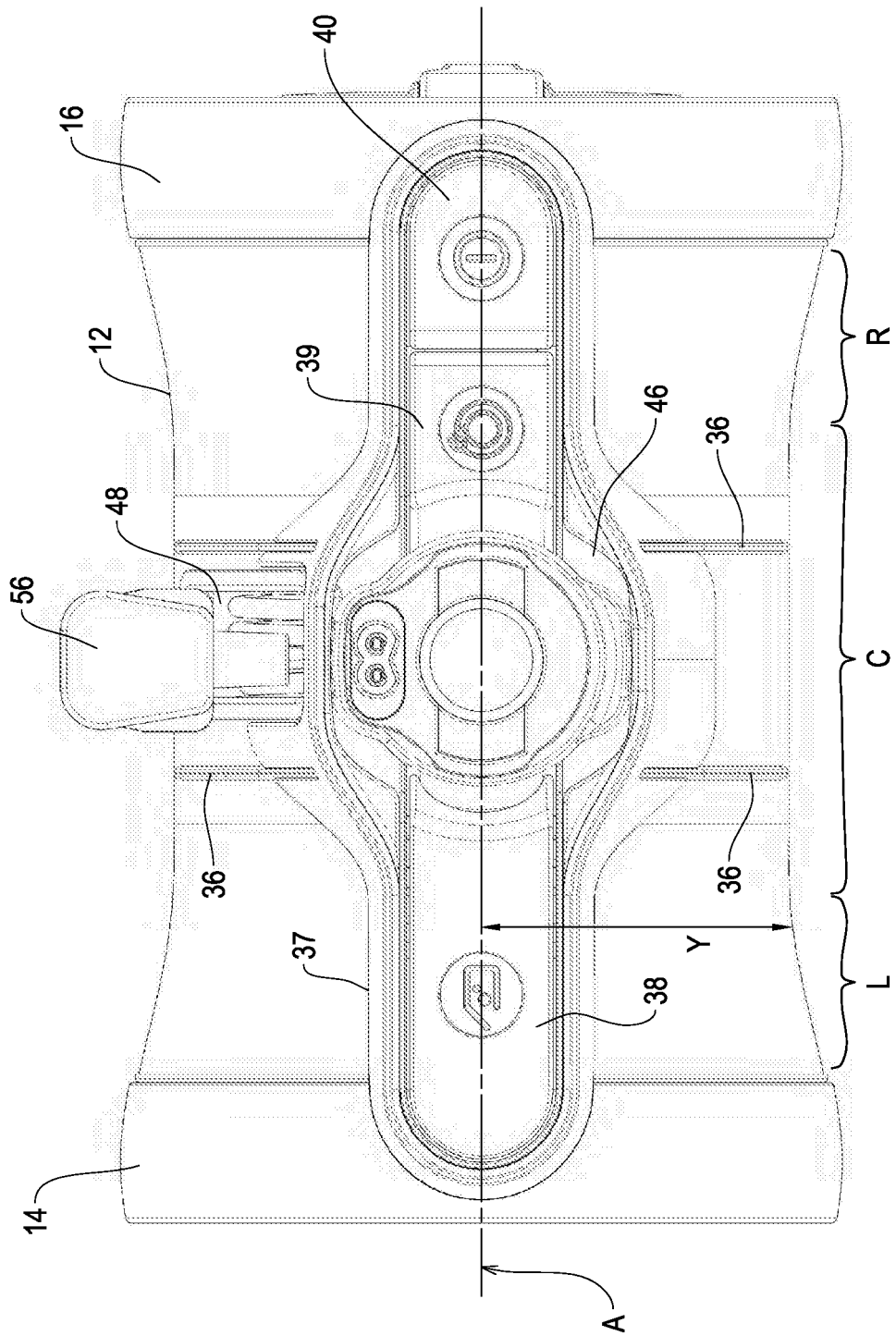


Figure 4

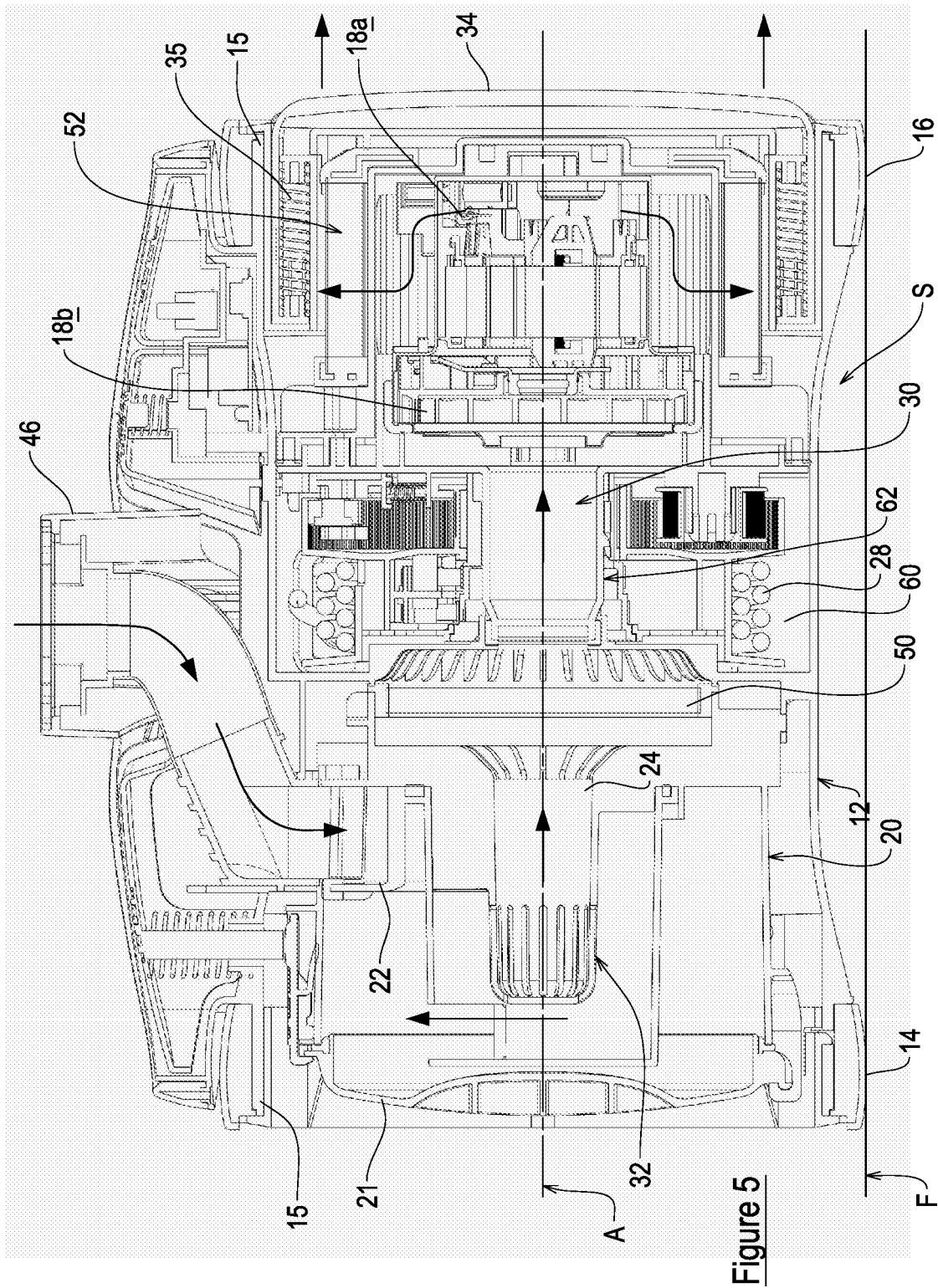


Figure 5

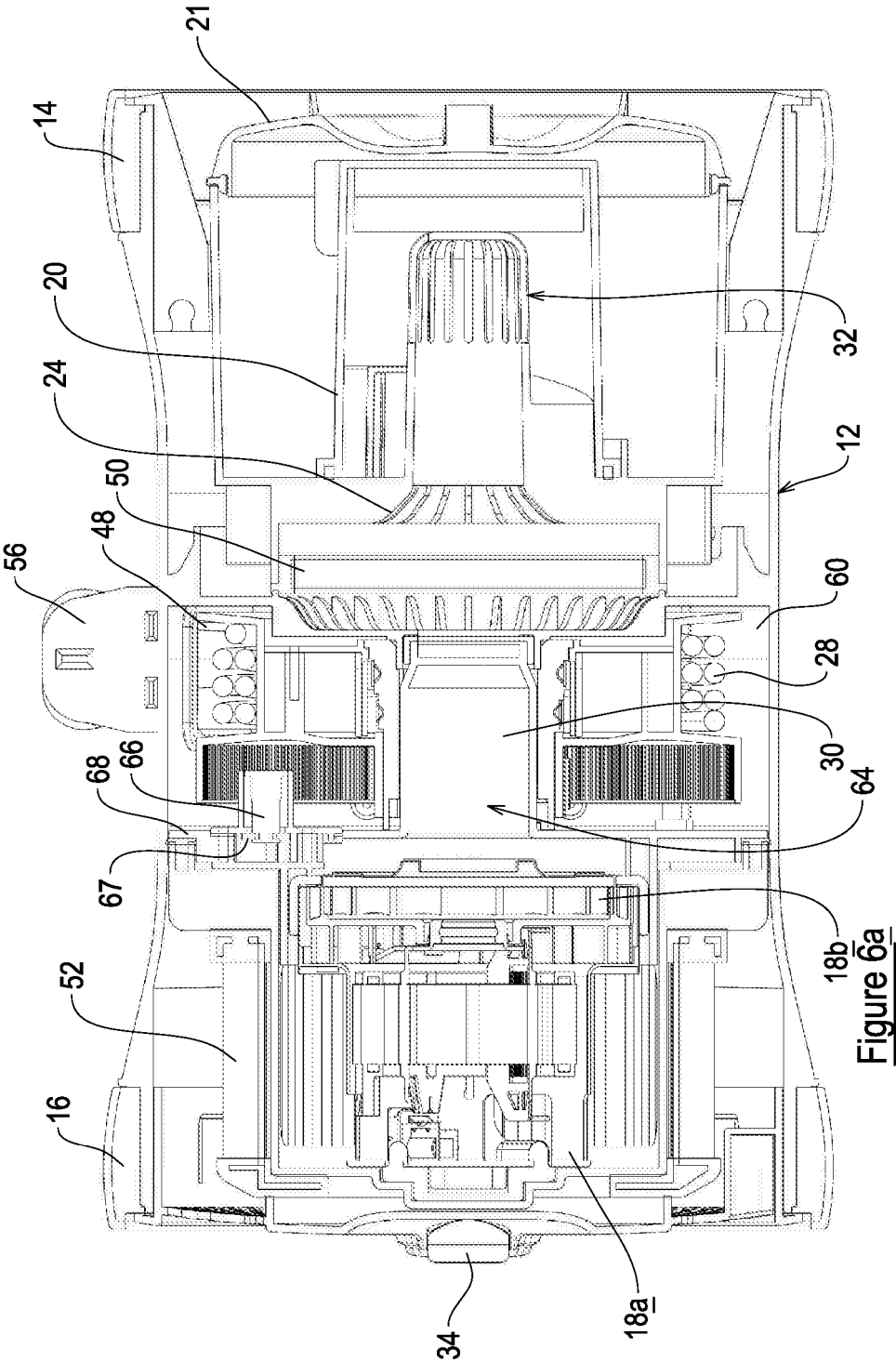


Figure 6a

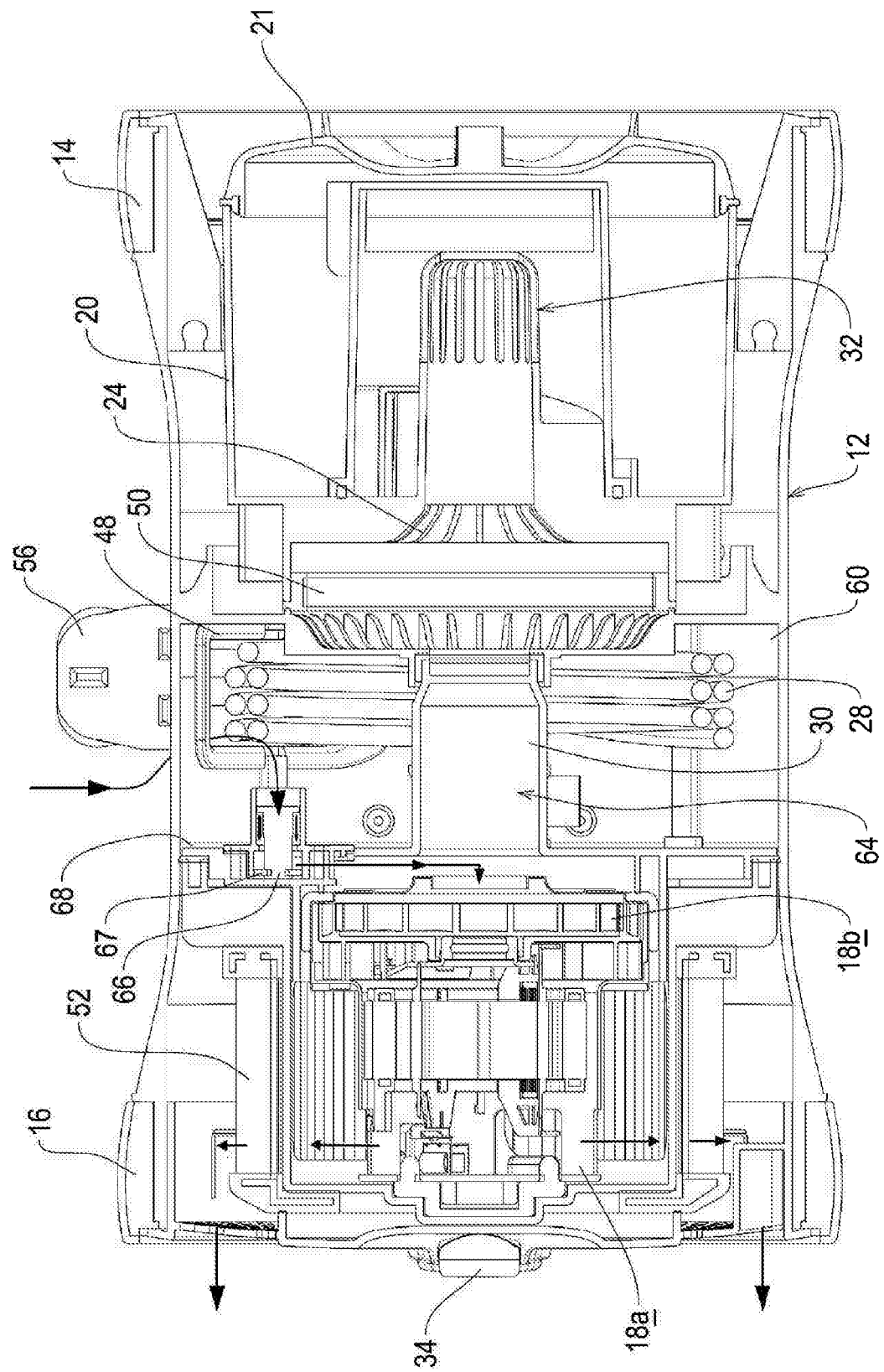


Figure 6b

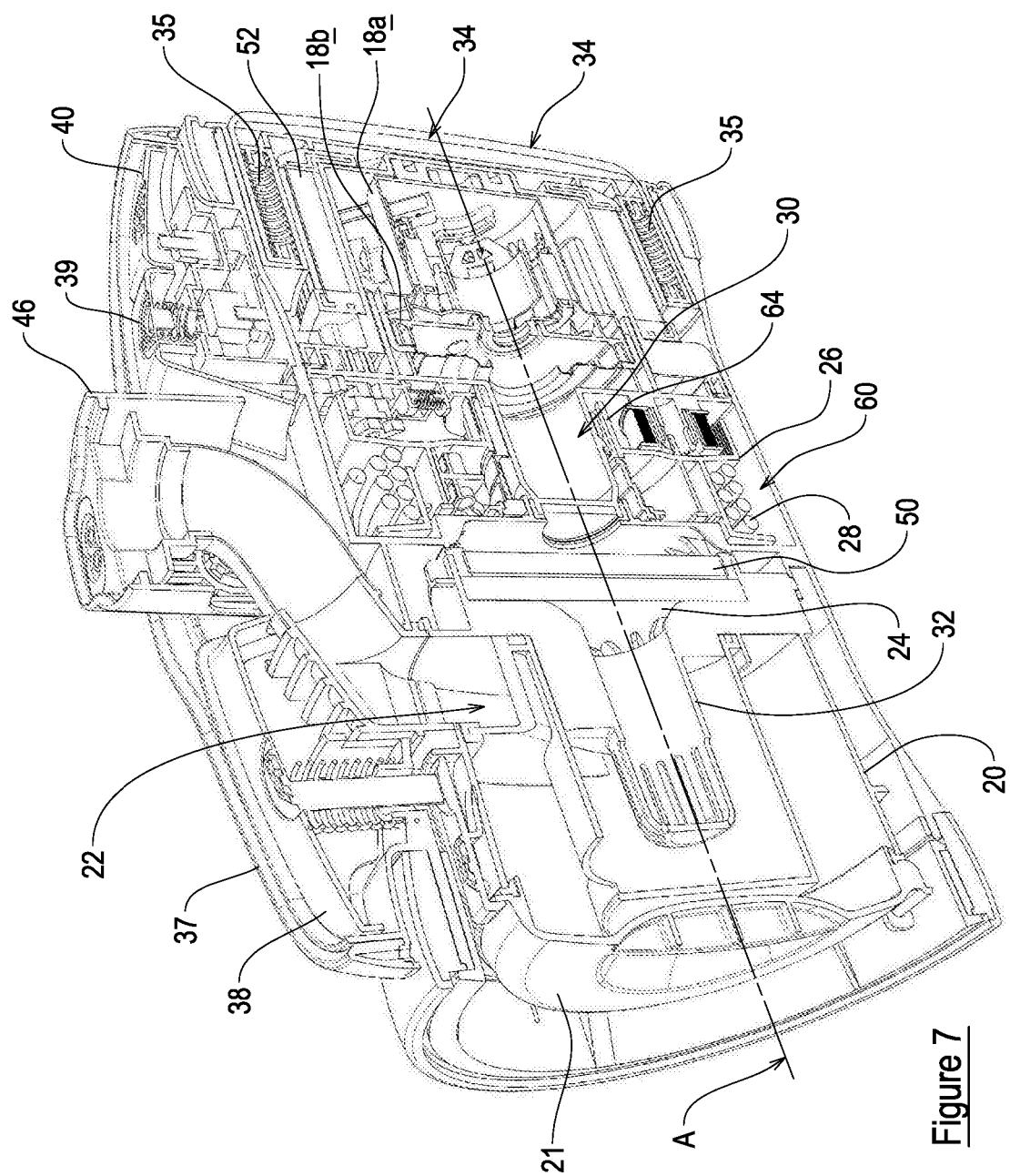


Figure 7

REFERENCES CITED IN THE DESCRIPTION

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